National Construction Summit 2022

The Construction Industry, Zero Waste, the Circular Economy and Climate Change

Jack O' Sullivan
Zero Waste Alliance Ireland

ZWAI
ZERO WASTE ALLIANCE IRELAND

Key Issues of Climate Change

- Human activities are the **main cause** of current global warming
- 17 of the 18 warmest years on record have been in **this 21st century**
- Each of the **last three decades** has been successively warmer than any preceding decade since 1850
- The period from 1983 to 2012 was the warmest 30-year period of the last 800 years in the Northern Hemisphere, and likely to be the **warmest 30-year period of the last 1400 years**
- **2021** was the one of the seven warmest years on record

- Atmospheric concentrations of **GHGs** are at levels that are **unprecedented** in at least 800,000 years
- Concentrations of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) have all shown large **increases since 1750** (40%, 150% and 20%, respectively)
- Multiple evidence indicates a strong, consistent, almost linear relationship between **cumulative CO_2 emissions** and projected global temperature change to the year 2100 and beyond
- To have a good chance of keeping **global warming under 2℃**, there is only a finite amount of greenhouses gases we can emit – this amount can be thought of as a **fixed budget amount**, or quota

So how much greenhouse gases have been emitted? And how much more can we “safely” emit?

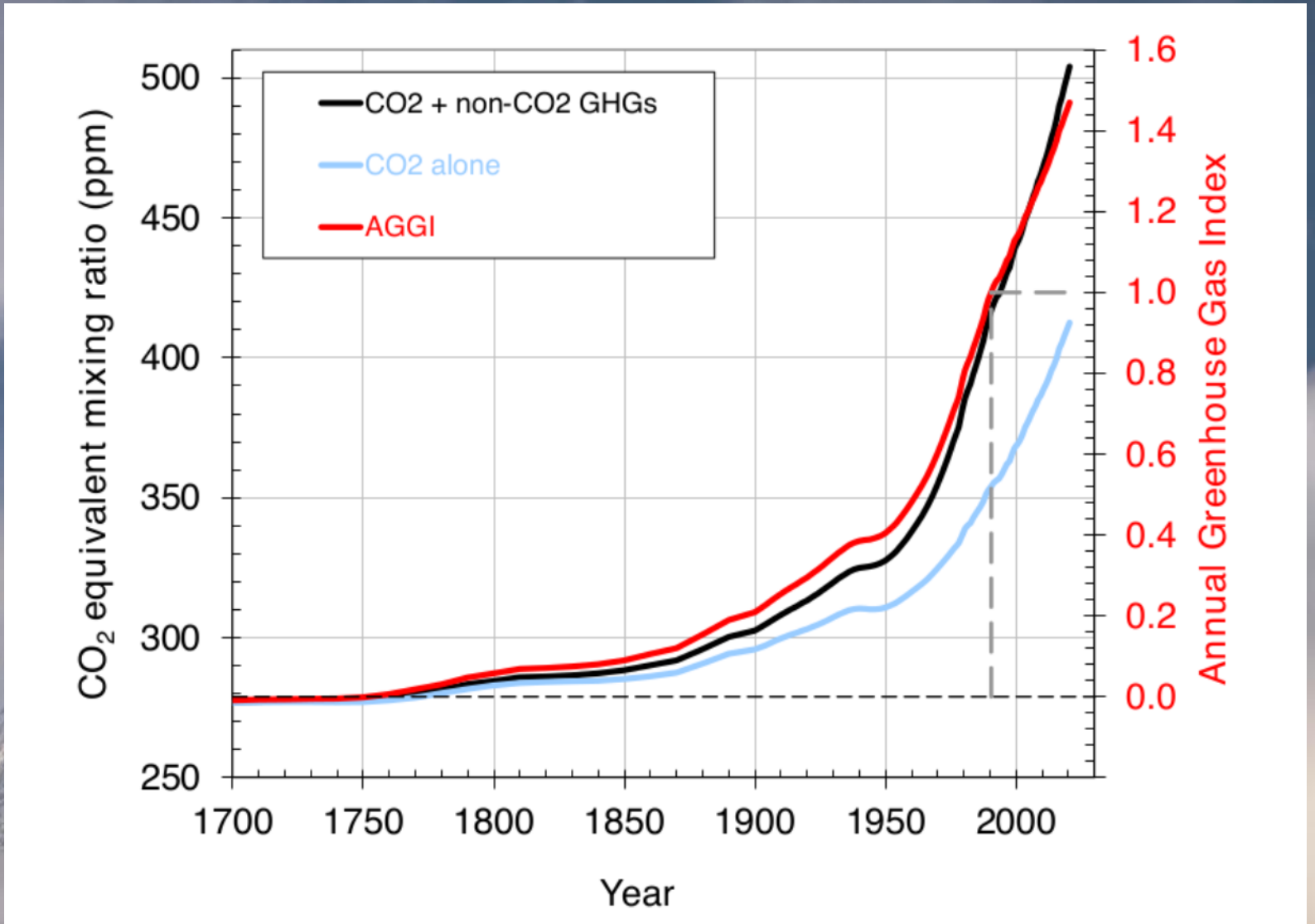
Cumulative Emissions, Budget & Quota

- The total carbon budget which the atmosphere can hold is some **2,900 $GtCO_2$ equivalents (-e)**. This is the cumulative amount of emissions if we are to limit total human-induced warming to less than 2℃ relative to the period 1861–1880 with a probability of >66%.
- That's our **absolute maximum** quota and it is **no longer safe**
- We therefore **have to** keep global warming below 1.5℃ (IPCC, 2018)

But how much of that have we already used?

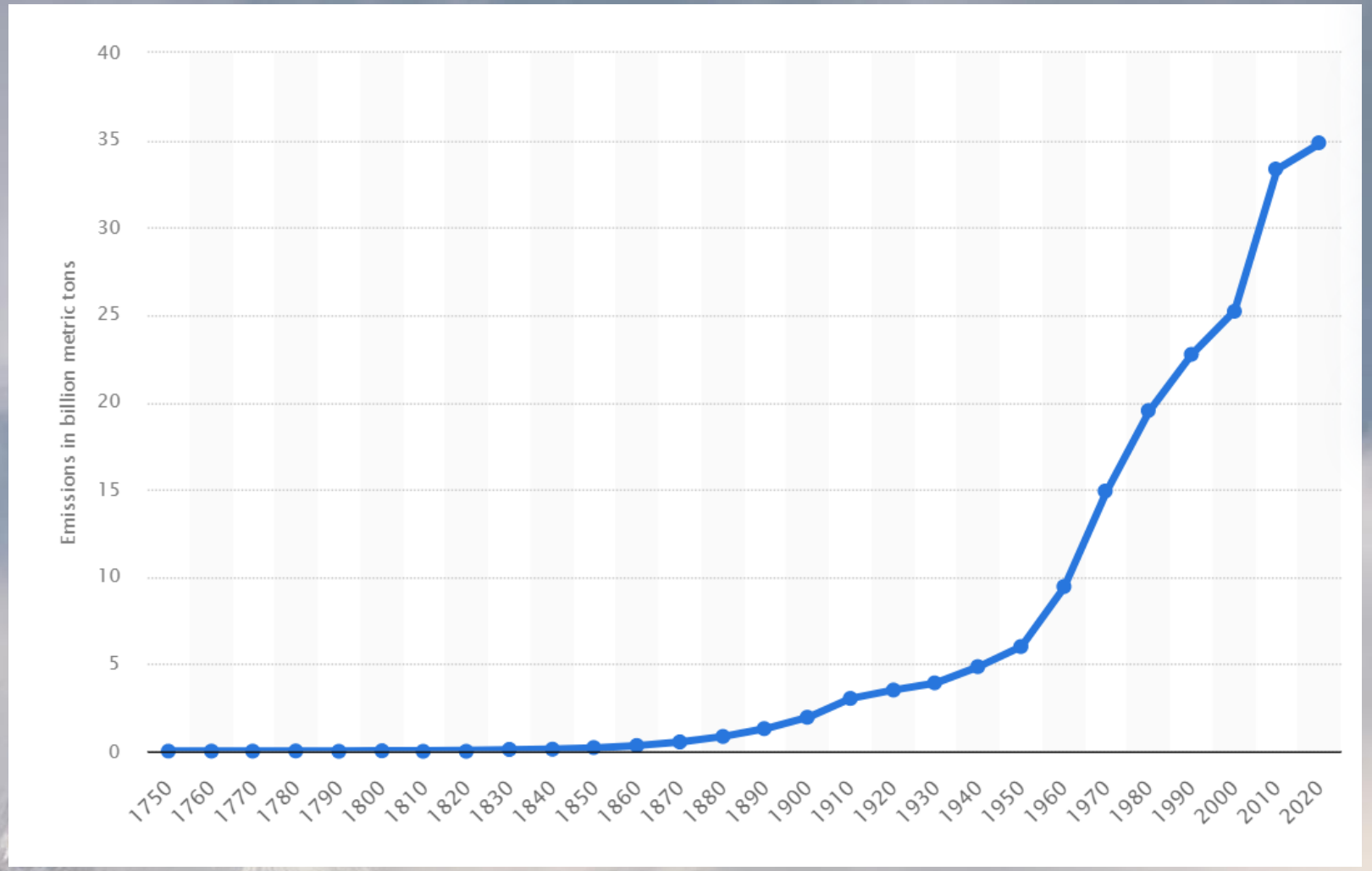
And how much is left?

Total CO_2-e concentrations have almost **doubled** since the start of the industrial revolution in 1750 (https://gml.noaa.gov/aggi/aggi.html)



- So far, human activity has caused about **1.0 °C** of global warming above the pre-industrial level and this is likely to reach **1.5 °C** between 2030 and 2052 if the current emission rates persist
- Preindustrial CO_2 concentration in the atmosphere was **280 ppm**
- Today, CO_2 concentration is **412.5 ppm.**
- CO_2 concentration is rising by about **2.5 ppm per year**
- In 2015, the Paris agreement was introduced with the main objective of limiting global temperature increase to **2 °C** by 2100 and pursuing efforts to limit the increase to **1.5 °C**
- CO_2 concentrations must be no **greater than 450 ppm** to limit surface temperature increases to **2℃** by **2054**
- At the current rate of emissions, **500 ppm will be reached in slightly less than 15 years**, i.e., 2037
- To stabilise warming, **CO_2 and other GHG** emissions will have to be **reduced to zero by 2037**
- Current studies estimate a 66% chance of global warming between **2.6°C** and **3.9°C,** with a 10% chance of warming **beyond 5°C**

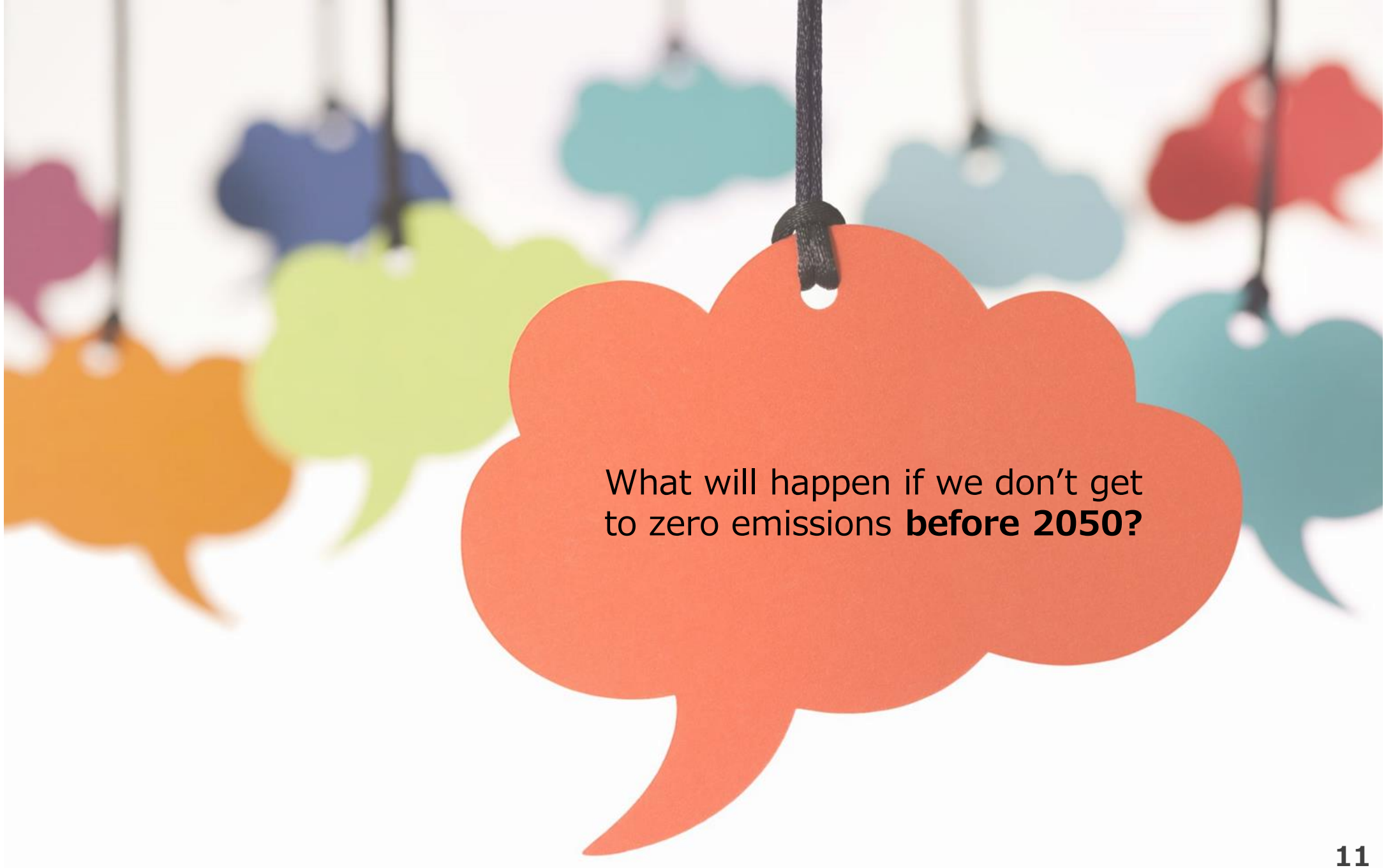
CO_2 emissions in billion metric tonnes (1750 pre-industrial to 2020):

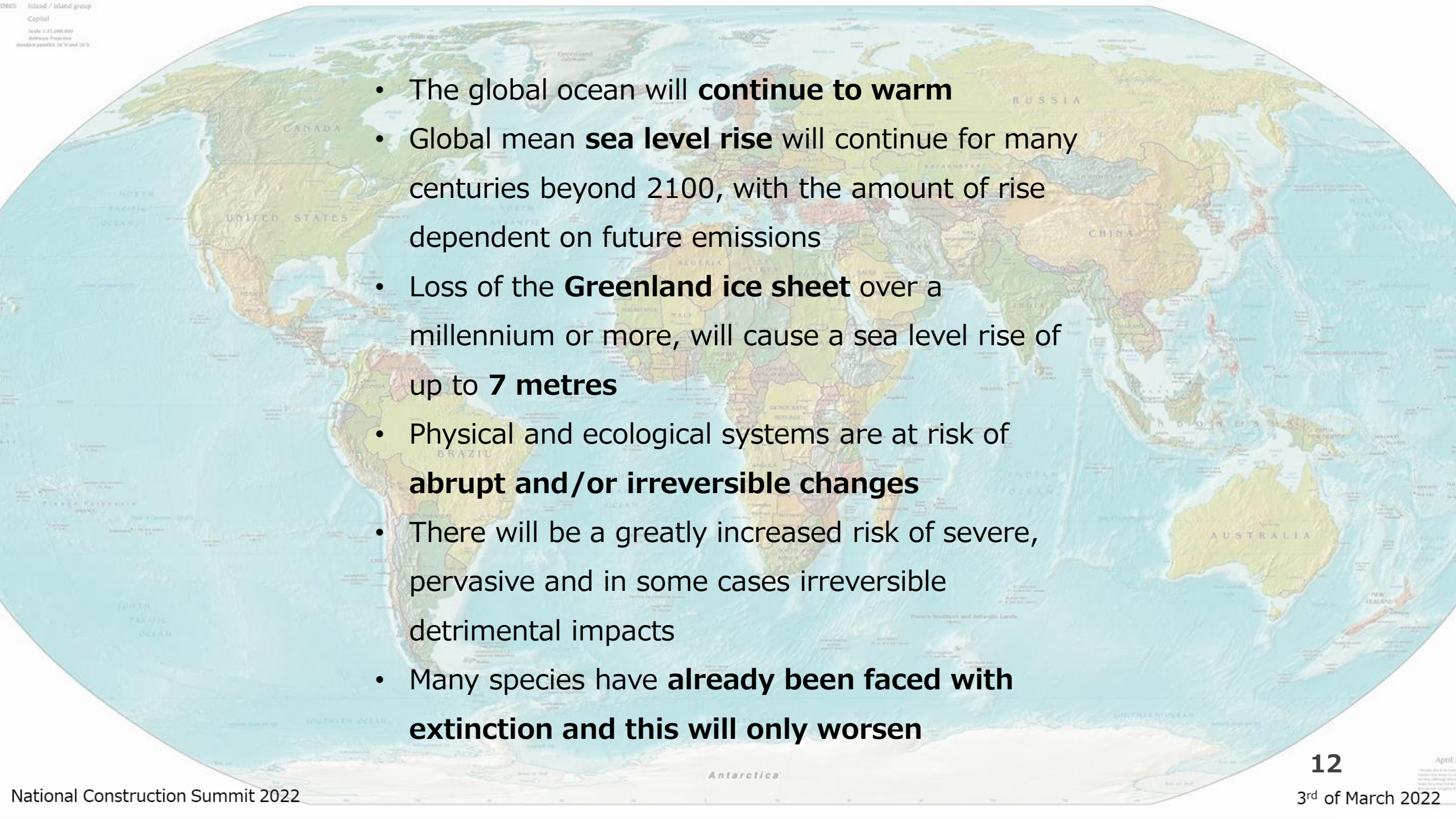


In 2020, The COVID-19 pandemic caused global CO_2 emissions to plummet 5% to 34.81 billion metric tonnes. It is projected that emissions rebounded in 2021 as lockdowns eased. (https://www.statista.com/statistics/276629/global-co2-emissions/)

Getting to Zero

- Carbon emitted from **soil is speeding** up global warming
- **55Gt CO_2-e** will be emitted from soil into the atmosphere by 2050
- The Thawing of permafrost is virtually certain and permafrost throughout the Arctic could be releasing **an estimated 300-600 million tons of net carbon** per year to the atmosphere which is roughly the equivalent of **Japan's annual emissions**
- Those emissions are going to increase and they are estimated to be **two to three times bigger** by the end of the century
- Permafrost holds around **1.5 trillion metric tons** of organic carbon, twice as much as **Earth's atmosphere currently holds**


What will happen if we don’t get to zero emissions **before 2050?**

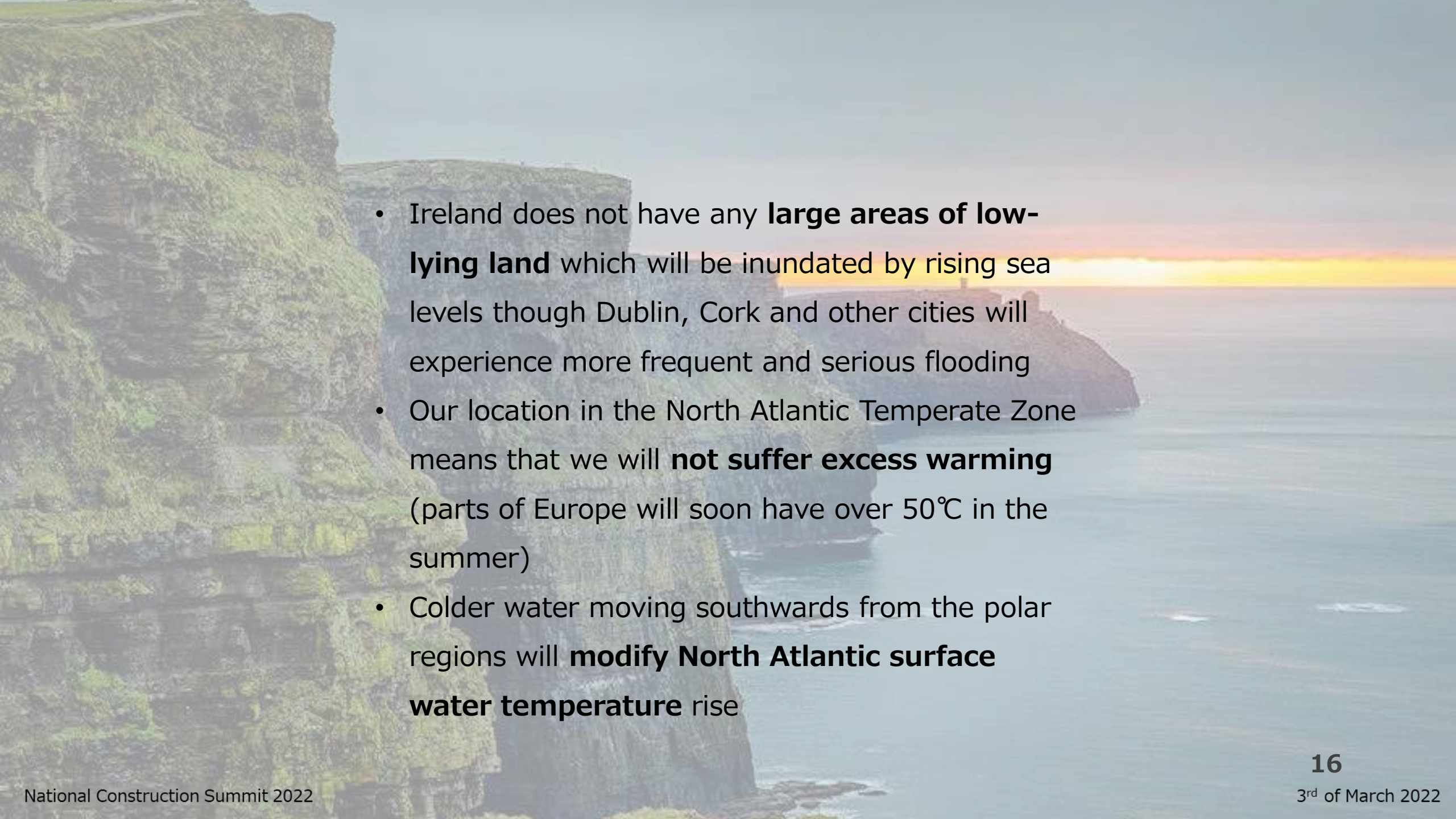


- The global ocean will **continue to warm**
- Global mean **sea level rise** will continue for many centuries beyond 2100, with the amount of rise dependent on future emissions
- Loss of the **Greenland ice sheet** over a millennium or more, will cause a sea level rise of up to **7 metres**
- Physical and ecological systems are at risk of **abrupt and/or irreversible changes**
- There will be a greatly increased risk of severe, pervasive and in some cases irreversible detrimental impacts
- Many species have **already been faced with extinction and this will only worsen**

And how is Ireland doing in all this?

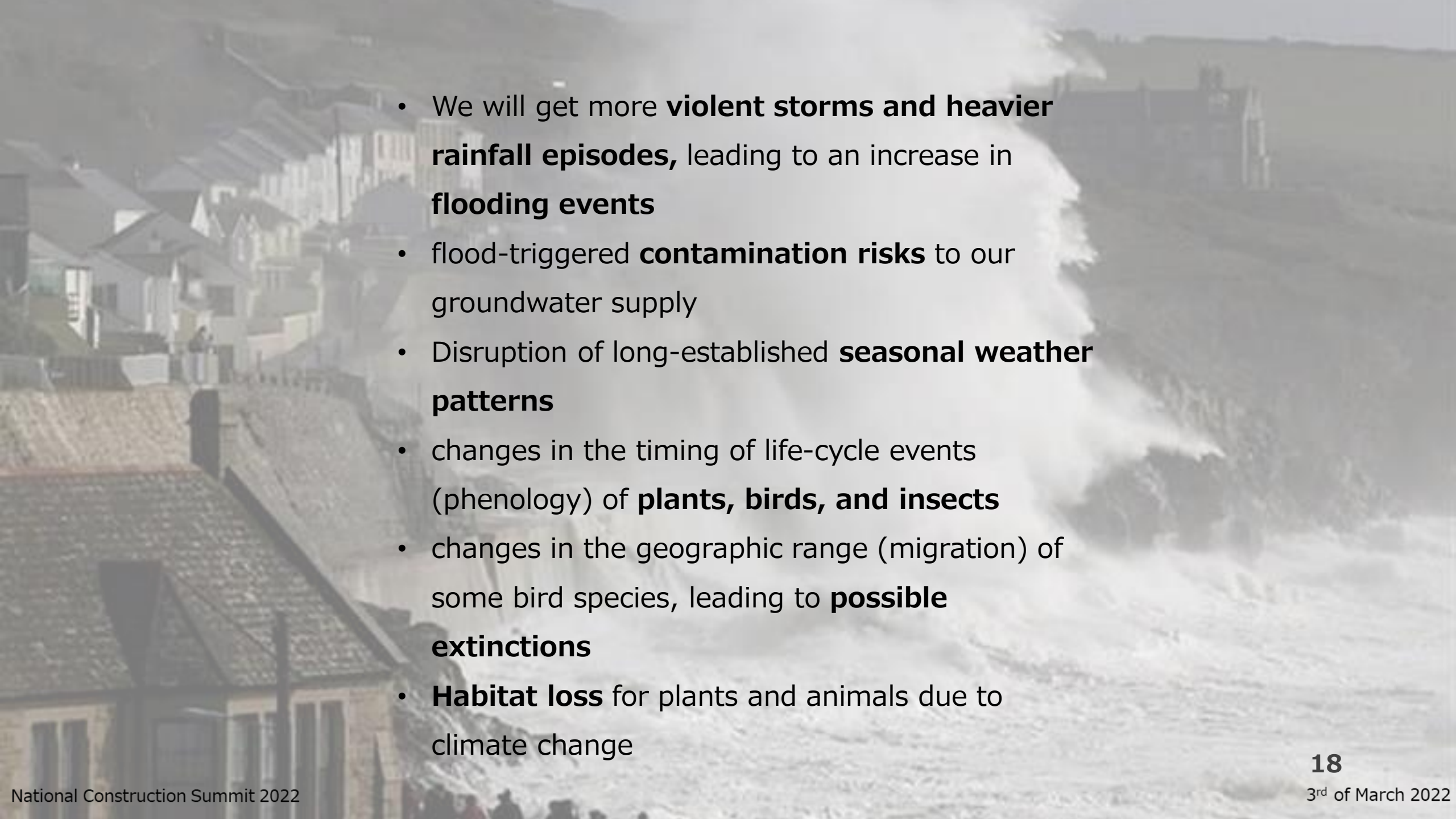
- Ireland **missed its agreed emissions reduction** target for 2020 by a substantial margin (SEAI Renewable Energy in Ireland, 2020)
- Without **major new policies and measures**, Ireland will also miss both its **proposed 2030 EU target** and its objective of reducing emissions of carbon dioxide by at least 80% (relative to 1990 levels) by 2050 by a very large margin (ibid)
- **Our agriculture** – based largely on ruminant animals (dairy and beef) faces **very significant** problems
- **Public transport outside of major cities** is poor; Ireland has a very high level of car dependency, all our goods are carried by road, and emissions from transportation will be hard to reduce
- Our renewable energy policy is skewed towards **large-scale onshore wind power**, with very little solar

The worst effects of climate disruption in Ireland are modified by....



- Ireland does not have any **large areas of low-lying land** which will be inundated by rising sea levels though Dublin, Cork and other cities will experience more frequent and serious flooding
- Our location in the North Atlantic Temperate Zone means that we will **not suffer excess warming** (parts of Europe will soon have over 50℃ in the summer)
- Colder water moving southwards from the polar regions will **modify North Atlantic surface water temperature** rise

And how will climate change affect us?

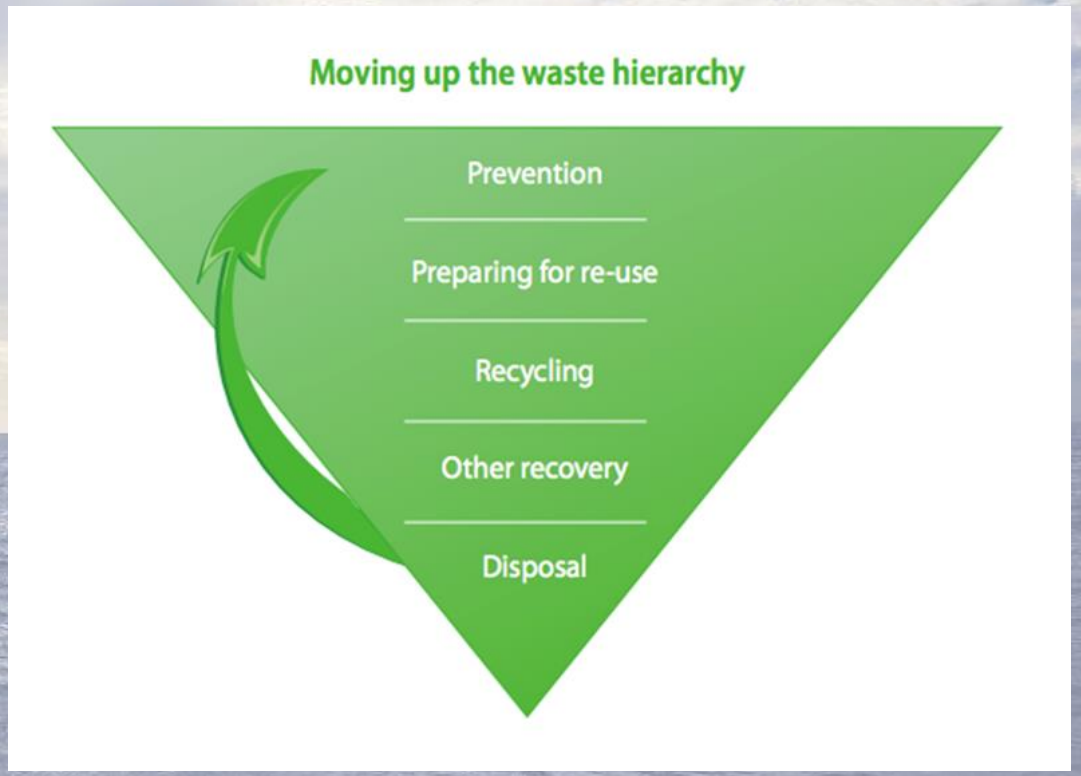


- We will get more **violent storms and heavier rainfall episodes,** leading to an increase in **flooding events**
- flood-triggered **contamination risks** to our groundwater supply
- Disruption of long-established **seasonal weather patterns**
- changes in the timing of life-cycle events (phenology) of **plants, birds, and insects**
- changes in the geographic range (migration) of some bird species, leading to **possible extinctions**
- **Habitat loss** for plants and animals due to climate change

Climate Change & Waste

- In 2020 the waste sector was responsible for **1.6% of Ireland's Greenhouse Gas emissions**
- Emissions from the waste sector **decreased by 0.8%** in 2020, with decreases in sub category landfills of 1.3%
- Overall, emissions decreased by **0.01 Mt CO_2e** compared to 2019 emissions
- If we avoided waste, we could reduce GHG emissions by a **more significant amount**
- No more than 1% of the products we purchase are 'durable' enough to be in use more than **six months later**. This wasteful consumption of materials **wreaks havoc** on our land and water resources, on our atmosphere, and contributes to climate change
- So we need to consider the **6Rs...**

The 6 R's & The Waste Hierarchy



Let's not sweep our waste problem under the carpet!

How to Approach Zero Waste

- Eliminate the production of materials and goods which **cannot be re-used, recycled or naturally biodegraded**
- **Eliminate incineration** — recycling plastic saves 3.7 to 5.2 times more energy, recycling paper saves 2.7 to 4.3 times more energy, and recycling metal saves at least 30 times more energy than can be recovered through incineration
- Waste is made by mixing a variety of discarded materials; therefore **segregation at source** is an essential pre-requisite to sustainable and climate friendly waste management

And what part does the construction industry play in all this?

C&D Waste and the Circular Economy

- While some other sectors are making gradual changes to reduce their consumption and waste generation to meet carbon emissions targets**, the construction industry seems to be lagging behind**
- Reusing buildings falls in line with the **philosophy of a circular economy** – an approach to production which aims to keep materials in use by extending product lifespans and looping waste back around as a resource
- If **individuals** are capable of practising this with items like water bottles, coffee cups and carrier bags, **industry** should be capable of making the necessary changes too
- There has so far been an emphasis on **"operational emissions"** associated with a building's use (such as lighting, heating and electricity)
- The result is that a new building which is well insulated, has an efficient heating system and uses energy-saving light bulbs will be labelled "sustainable", **regardless of whether its construction was environmentally friendly**
- The carbon footprint generated by creating the building itself is often overlooked. This is called **"embodied carbon",** and refers to emissions from extracting and transporting materials, constructing buildings, and eventually demolishing them
- Embodied carbon emissions can represent up to **70% of a building's carbon emissions over its lifetime**
- This figure that will grow as operational energy is increasingly generated from renewable sources
- More than **half of a building's lifetime carbon footprint can be emitted before it is even occupied**

(https://theconversation.com/we-have-reusable-cups-bags-and-bottles-so-why-are-our-buildings-still-single-use-171345)

C&D Waste in the EU

- Construction and demolition waste (CDW) accounts for **more than a third** of all waste generated in the EU
- This contains a variety of materials such as **concrete, bricks, wood, glass, metals and plastic**
- CDW has a **high resource value** and could be easily reprocessed into new products or materials
- When it is **not separated at source**, CDW can also contain small amounts of **hazardous materials** such as solvents and asbestos
- These can pose particular **risks to the environment and impede recycling**
- Despite its potential, the level of recycling and material recovery of construction and demolition waste varies greatly across the EU, ranging from **less than 10% to over 90%**
- Why is this? Because EU counties apply different definitions of construction and demolition waste, which makes **cross-country comparisons difficult**

Under the 2008 **EU *Waste Framework Directive***, construction and demolition waste is a priority waste stream. It sets the following objectives:

- By 2020, the preparing for **re-use, recycling and other material recovery** of non-hazardous CDW shall be increased to a minimum of 70% by weight
- To promote **selective demolition** to enable removal and safe handling of hazardous substances and facilitate re-use and high-quality recycling by selective removal of materials and establishing sorting systems
- To **reduce waste generation** in the first place

And are we sticking to this in Ireland?

C&D Waste in Ireland

- The quantity of C&D waste generated and collected in Ireland increased to **8.8 million tonnes in 2019** (an increase of 2.6 million tonnes from 2018's figures)
- Only **7% was recycled**
- **Soil and stones** (and similar material) made up the vast majority (85%) of C&D waste collected in 2019
- The next largest C&D waste types generated in 2019 were **concrete, brick, tile and gypsum waste (7%) and mixed C&D waste (4%)**
- Only **2.5% of C&D waste was collected separately** as single material streams (wood, glass, plastic or metal)

How Can we Improve?

- **Preventing** all forms of waste and promoting **re-use** is essential to **the circular economy**
- This is particularly relevant for the construction sector; which handles **large volumes of natural resources**, such as soil and stone. Successful activation of the circular economy in this sector could see **millions of tonnes of resources being beneficially reclaimed every year**
- **Separation of materials**, either at C&D sites or at waste facilities, is the necessary first step to enabling recycling
- Prevention and improved recycling of C&D waste could be achieved by employing best practice **circular construction activities**
- These include **designing out waste, enhanced segregation of C&D materials into individual material streams and by maximising the use of resources**
- Opting for more **sustainable materials** for building such as **timber, clay, repurposed materials, plant-based Polyurethane Rigid Foam, etc.**
- Wood is a **lightweight, strong building material with excellent insulating** properties. Its ability to **sequester carbon** means wood is extremely sustainable

Sustainable Building Materials

Timber house

Clay house

Straw Bale house

Hemp Lime house


What can we
take away
from all this?

Think Positive

- Dealing with the waste we produce does **not require high-technology** solutions
- We need to **re-think**, and to consider that our discarded stuff is a **productive resource**, capable of generating new opportunities for local economic development
- It is **wrong** that society has to pay for the disposal of discarded materials by landfilling, incineration or export, when these unwanted materials and goods could be **creating income and wealth through re-using, recycling, re-manufacturing, resulting in job creation, and saving on imports**

Essential Policies and Approaches

- Industry **MUST** fully adopt the principle of extended producer responsibility—all products must be **easily repaired, re-used and (at end-of-life) be taken apart and the components re-used, repaired or recycled**
- Re-use, recycling and composting must be incentivised financially and through direct assistance
- Better **segregation at source** is essential
- Stricter measures regarding **circular construction measures** need to be implemented at **policy level**
- The use of **more sustainable building materials** should be mandated at policy level

Discarded Materials and Climate Change

There are some positive signs:

- The European Commission is becoming **more critical of incineration; landfills are being phased out**
- **The Community Reuse Network** Ireland is doing excellent work
- **The Citizens' Assembly** provided an excellent set of policies and suggestions for action
- The Climate Change Committee of **An Taisce** provides **a detailed analysis and commentary on Government policies and actions**
- **"Repair cafes"** and **recycling activities** are on the increase
- More and more **architects are opting for sustainable** materials and are advocating for repairing, restoring and re-purposing where possible, instead of demolition and replacement by new builds

So to wrap things up…

National Construction Summit 2022

Climate Disruption:

- **A major threat**, proceeding faster than anticipated, and in danger of becoming irreversible, with very damaging consequences

Waste of discarded materials (including C&D waste):

- Not the most serious contributor to climate change, but **must** be addressed at all levels
- **Re-design**, **avoid unnecessary disposable stuff**, implement **Zero Waste and the Circular Economy**
- Use of **more sustainable materials** and **better segregation** at source

Every climate change mitigation effort counts!


“Zero Waste and the Circular Economy are complementary therapies for a planet which is being increasingly damaged by unsustainable exploitation of the Earth's finite resources and by rapid disruption of the climate regulation system.”
—— Zero Waste Alliance Ireland

Thank you for listening!

Presentation by Jack O' Sullivan
Zero Waste Alliance Ireland

ZWAI
ZERO WASTE ALLIANCE IRELAND

If you would like to discuss further, contact me at jack@zerowasteireland.com or admin@zwai.ie or call 086 381 9811.